CLAIMS

I claim:

1. An apparatus for dielectrophoretic separation, comprising:

a fluid flow channel disposed on a substrate, wherein said fluid flow channel is provided with fluid inlet and outlet means in fluid communication with said flow channel, and wherein said flow channel has a plurality of insulating structures disposed therein;

an electrode in electric communication with each fluid inlet and outlet means; and

power supply means connected to said electrodes to generate an electric field within said flow channel.

2. The apparatus of claim 1, wherein said fluid flow channel is an open channel.

3. The apparatus of claim 1, wherein the substrate is a polymer material.

4. The apparatus of claim 1, wherein the plurality of insulating structures is arranged in an array.

5. The apparatus of claim 1, wherein at least a portion of the cross-sectional shape of the insulating structures in the plane of fluid flow is composed of a circle, a straight line, a cusp, a concave curve, a convex curve, or an acute angle, or combinations thereof.

6. The apparatus of claim 5, wherein the insulating structures comprise circular posts.

7. The apparatus of claim 5, wherein the insulating structures are square

posts.

8. The apparatus of claim 1, wherein the insulating structures are joined together.

9. The apparatus of claim 1, wherein the electric field is a substantially constant applied electric field.

10. The apparatus of claim 1, wherein the electric field varies in amplitude and period.

11. The apparatus of claim 1, wherein the electric field has a non-zero cyclic average.

12. The apparatus of claim 1, wherein the electric field is a combination of an electric field that is substantially constant and an electric field that varies in amplitude and period.

13. The apparatus of claim 1, wherein the electric field is aligned at an angle with respect to the array of posts.

14. A method for dielectrophoretic separation of particles, comprising:

providing at least one fluid flow channel, wherein the flow channel is provided with fluid inlet and outlet means in fluid communication with the inlet and outlet ends of the flow channel and electrodes in electric communication with the inlet and outlet means, wherein the flow channel is disposed on a substrate, and wherein the flow channel has a plurality of insulating posts disposed therein;

admitting a fluid containing a suspension of particles to the flow channel through the inlet reservoir;

applying an electric field to the suspension to effect dielectrophoretic

separation of the particles; and

extracting the separated particles from the outlet of the flow channel.

15. The method of claim 14, wherein the electric field varies in amplitude and period.

16. The method of claim 14, wherein the electric field has a non-zero cyclic average.

17. The method of claim 14, wherein the electric field is a substantially constant applied electric field.

18. The method of claim 14, wherein the electric field is a combination of an electric field that is substantially constant electric field and an electric field that varies in amplitude and period.

19. The method of claim 14, wherein the electric field is aligned at an angle with respect to the array of posts.

20. A method for spatial separation of particles, comprising:

providing at least one fluid flow channel, wherein the flow channel is provided with fluid inlet and outlet means in fluid communication with the inlet and outlet ends of the flow channel and electrodes in electric communication with the inlet and outlet means, wherein the flow channel is disposed on a substrate, and wherein the flow channel has a plurality of insulating posts disposed therein;

admitting a fluid containing a suspension of particles to the flow channel through the inlet reservoir;

applying an electric field to the suspension to effect dielectrophoretic separation of the particles; and

extracting the separated particles from the outlet of the flow channel.

21. The method of claim 20, wherein spatial separation comprises filtration, concentration, or fractionation.

22. The method of claim 20, wherein the electric field varies in amplitude and period.

23. The method of claim 20, wherein the electric field has a non-zero cyclic average.

24. The method of claim 20, wherein the electric field is a substantially constant applied electric field.

25. The method of claim 20, wherein the electric field is a combination of an electric field that is substantially constant and an electric field that varies in amplitude and period.

26. An apparatus for concentrating and spatially segregating particles, comprising:

a fluid flow channel disposed on a substrate, wherein said fluid flow channel is provided with first and second ends and fluid inlet and outlet means in fluid communication with the first and second ends, and wherein said flow channel has a plurality of insulating structures disposed therein;

an electrode in electric communication with each fluid inlet and outlet means; and

power supply means connected to said electrodes to generate an electric field within said flow channel, and wherein the second end of said flow channel is tapered to concentrate the electric field.

27. The apparatus of claim 26, wherein said fluid flow channel is an open

channel.

28. The apparatus of claim 26, wherein the substrate is a polymer material.

29. The apparatus of claim 26, wherein the plurality of insulating structures is arranged in an array.

30. The apparatus of claim 29, wherein the array of insulating structures is shaped so as to concentrate the electric field.